

COLLECTING TRITIUM STACK BUBBLER SAMPLES

Purpose This Meteorology and Air Quality Group (MAQ) procedure describes the collection of bubbler samples from sampled tritium-emitting stacks at Los Alamos National Laboratory as part of the Rad-NESHAP Project. This procedure also describes the chain of custody documentation steps to be performed during tritium bubbler calibrations.

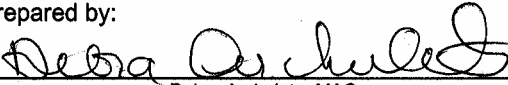
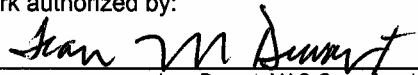
Scope This procedure applies to MAQ personnel and HSR-1 RCTs assigned to collect bubbler samples, deliver them to the analysis laboratory, and complete associated chain-of-custody documentation; and to HSR-4 RIC personnel who perform tritium bubbler calibrations.

**In this
Procedure**

Topic	See Page
General Information About This Procedure	2
Who Requires Training to This Procedure?	3
Background and Overview	4
Worker Safety	5
Pre-Collection Preparation	6
Bubbler Sample Vial Collection	8
Post-Collection Measurements	10
Delivering Samples to HPAL	11
Unscheduled Bubbler Sample Vial Collection	12
Sample Custody During Bubbler Calibration	14
Records Resulting from this Procedure	16

**Hazard
Control Plan** The hazard evaluation associated with this work is documented in Attachment 1: Initial risk = **low**. Residual risk = **low**. Work permits required: none. First authorization review date is one year from group leader signature below; subsequent authorizations are on file in group office.
NOTE: This work authorization applies only to MAQ personnel. Supervisors of personnel in other groups are responsible for authorizing work for their employees.

Signatures
(continued on
next page)

Prepared by:  Debra Archuleta, MAQ	Date: 4/16/03
Work authorized by:  Jean Dewart, MAQ Group Leader	Date: 4/17/03

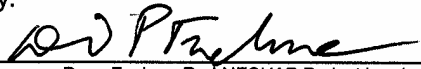

04/25/03
04714703

CONTROLLED DOCUMENT

This copy is uncontrolled if no red stamp is present on printed copies.
Users are responsible for ensuring they work to the latest approved revision.

General information about this procedure

Signatures,
continued

Approved by:  Dave Fuehne, Rad-NESHAP Project Leader	Date: 4-16-03
Approved by:  Terry Morgan, QA Officer	Date: 4/16/03

Attachments

This procedure has the following attachments:

Number	Attachment Title	No. of pages
1	Hazard Control Plan	2
2	Tritium Stack Sample Data Form and Chain of Custody Record	1
3	Tritium Stack Sample Data Form and Chain of Custody Record for HSR-1 RCT Unscheduled Sample Collection.	1
4	HPAL Submittal Form	1
5	Sample Custody Record for Bubbler Calibration	1

History of revision

This table lists the revision history and effective dates of this procedure.

Revision	Date	Description Of Changes
0	11/27/95	New document.
1	3/6/97	Process and management changes.
2	10/21/98	Custody during calibration added.
3	6/2/00	Added HCP as attachment 1, removed list of stacks, reordered some steps, made editorial changes throughout.
4	7/12/01	Changes to address assessment observations: step 6 changed, reference to DR procedure clarified to apply to whole procedure.
5	12/10/01	Requirements added for use of DOT-compliant transportation container.
6	8/30/02	Changed location for performing weighing of spikes and vials.
7	04/25/03	Quick-change revision to change laboratory site to TA-50 (page 10).

General information about this procedure, continued

Who requires training to this procedure? The following personnel require training before implementing this procedure:

- MAQ personnel and HSR-1 RCT personnel assigned to collect tritium bubbler samples
- HSR-4 RIC personnel who perform tritium bubbler calibrations

Personnel previously trained to revision 6 of this procedure do not require retraining to this revision.

Training method The training method for this procedure is **on-the-job** training by a previously trained employee and is documented in accordance with the procedure for training (MAQ-024).

Annual retraining is required and will be by self-study (“reading”) training.

Prerequisites In addition to training to this procedure, the following training is also required before performing this procedure:

- Radiological Worker
- Facility-specific requirements for each facility

A “Q” level security clearance is required to collect samples from some sites.

Definitions specific to this procedure Bubbler: An apparatus designed to collect tritium in both water vapor and gaseous form from air taken from the stack by bubbling the air through ethylene glycol in a manner that allows discrimination between the water vapor and gaseous forms.

PPE: Personnel equipment and clothing used to protect the individual from becoming contaminated by hazardous or radioactive material during an operation.

NIST: The National Institute of Standards and Technology which provides traceable, certified calibration of many instruments and tools.

References The following documents are referenced in this procedure:

- MAQ-024, “Personnel Training”
- MAQ-026, “Deficiency Reporting and Correcting”
- 49 CFR 173 Subpart I, “DOT regulations for the transportation of radioactive material”

Background and overview

Background

The tritium bubblers currently used at the Laboratory consist of a vacuum pump that draws a sample of gas from a stack or duct effluent that is processed in two phases. In the first phase, the sample is “bubbled” through glycol in three successive sample vials. The glycol in these vials removes essentially all water vapor (including HTO) from the sample gas. The dry air then passes across a heated palladium bed. This catalyst bed oxidizes the HT remaining in the sample to HTO. This gas stream is then again bubbled through an additional set of three glycol vials, identical to the process described above. The independent analysis of each set of three vials will give a measurement of HTO and HT, respectively, in the duct effluent. In addition, a seventh vial is submitted to the HSR-4 Health Physics Analysis Laboratory (HPAL) with each set of bubbler vials. This vial is used as a blank for quality control purposes.

Overview of bubbler sample vial collection

This procedure describes the five processes required to collect the bubbler sample vials.

- preparing fresh bubbler sample vials for the upcoming sampling period
 - collecting bubbler sample vials
 - weighing bubbler sample vials after collection
 - delivering samples to HPAL for analysis
 - documenting the process and submitting records
-

Frequency of bubbler sample vial collection

MAQ personnel or an **HSR-1 RCT** collects the bubbler vials each week, normally on Tuesday morning. Extended holiday samples may be collected in the morning of the next working day if all interested parties agree. Extra collection cycles may be established as part of system maintenance or test activities.

NOTE: Varying the collection frequency could impact a nuclear facility’s compliance with its Operational Safety Requirements or Technical Safety Requirements. Ensure any change in the sample collection schedule is coordinated with the responsible Facility Managers or their designees.

Bubbler calibration chain of custody

HSR-4 RIC performs regular calibrations of the bubblers by emitting a known amount of tritium up the stack and measuring the amount collected by the bubblers. To do this, the regular sample vials must be replaced with new vials for the calibration. Follow the steps in the chapter *Sample custody during bubbler calibration* to document the removal and handling of the regular sample vials.

Worker safety

Performing work safely

DO NOT perform work under conditions you consider unsafe. Before beginning work described in this procedure, review safety needs and requirements, identify hazards, and develop hazard mitigation measures. Be aware that facility configurations and hazards may change between visits. Hazards to assess include, but are not limited to the following:

Rotating machinery and electrical equipment - Work described in this procedure is performed in the vicinity of fans, motors, and other facility equipment. Do not work in the vicinity of exposed conductors or if guards are not in place on operating facility equipment.

Radiological hazards - Stack sampling locations are often radiologically controlled. Be sure to comply with all facility-specific PPE requirements before entering controlled areas.

Facility management units - Work control is the responsibility of the Facility Manager. Obtain approval from facility management before beginning work described in this procedure. Assure you have completed all facility-specific training requirements (see prerequisite training requirements on page 2).

Contact the Rad-NESHAP Project Leader if working conditions are found to be unsafe.

Pre-collection preparation

Overview A bubbler stack sampling period normally covers a one week period from Tuesday to Tuesday. The start and end times of the period are determined by the actual bubbler sample vial collection time. The sample vials must be washed, rinsed, labeled, weighed empty, and filled with ethylene glycol. Pre-sample period empty vial weights are required to complete sample analysis. Vial preparation activities are performed in the preparation laboratory located in TA-50, Building 1, Room 1.

Document problems with DRs Whenever any problems are encountered that result in loss of samples or data (including mechanical problems or breaks in the chain of custody), document them as a deficiency in accordance with MAQ-026, "Deficiency Reporting and Correcting."

Preparing bubbler sample vials To prepare bubbler sample vials, perform the following steps:

Step	Action
1	Before preparing bubbler sample vials, see the Worker safety section of this procedure and review safety needs and requirements. <u>DO NOT perform work under conditions you consider unsafe.</u>
2	Prepare 6 vial cap labels for the vials for each bubbler. Indicate the technical area (TA) and building, stack identifier (ES), the vial identifier ("A" thru "F"), and the sampling period dates on the labels. Attach these labels to new vial caps (do not re-use caps).
3	Label a disposable 20 ml polyethylene vial as a blank for each bubbler site. Indicate the TA, Bldg., and ES on the labels.
4	Prepare a Tritium Stack Sample Data Form and Chain of Custody Record (Attachment 2) and an HPAL Submittal Form (Attachment 4), with a yellow carbon copy page, for each bubbler. Record the sampling period beginning and end dates, TA, Bldg, ES, and attach a barcode to the Tritium Stack Sample Data Form and Chain of Custody Record. Attach a barcode to the white and yellow copies of the HPAL Submittal Form.
5	At the TA-50 HPAL laboratory, empty the sample and 20 ml blank vials from the previous week into the HPAL sink. NOTE: This is the only sink approved for the disposal of bubbler samples. Dispose of the lids in the radioactive trash box at the HPAL laboratory. Record the date and time of sample disposal on the corresponding Tritium Stack Sample Data Form and Chain of Custody Record.

Steps continued on next page.

Pre-collection preparation, continued

Step	Action
6	Wash and rinse each vial, then dry the interior and exterior of each vial with a Kimwipe and return the vials to the proper sample container.
7	Before moving the vial and containers from the HPAL laboratory, call an RCT at 7-6917 to survey the sample vials and containers for contamination. If sample vial(s) or container(s) are found to be contaminated, decontaminate the vial(s) and or container in accordance with instructions from the RCT.
8	After the RCT has verified that the containers are not contaminated, sign the ESH-1 Equipment and Item Removal Log and take the sample containers to the preparation laboratory in the uncontrolled area in the basement (room 1, north end of the basement).
9	Place the previously prepared lids on the vials.
10	Label each plastic sample container with a barcode matching those placed on the forms.
11	Before weighing the sample vials using the preparation laboratory's calibrated electronic balance, check the calibration expiration date; and verify performance by checking the balance using 100 gram, 20 gram, and 5 gram certified weights traceable to NIST. If the scale reading for any weight is not within ± 0.2 grams of the certified weight, have the scale re-calibrated before weighing the samples. Record this check in the Balance and Precision chemical pump Logbook and sign and date the entry.
12	Using the calibrated balance, weigh each empty vial with the lid installed. Record the weights in column labeled "vial wt.(g)" on the Tritium Stack Sample Data Form and Chain of Custody Record for each sampled stack.
13	Adjust the Precision chemical pump (dispensette) as necessary to obtain a 30 ml output. Verify the setting by pumping 30 ml into a graduated cylinder. Record this check in the Balance and Precision Chemical Pump Logbook and sign and date the entry. After performing the verification and adjusting the amount of glycol in the graduated cylinder as necessary, use this glycol to fill the first bubbler vial.
14	Fill the empty bubbler vials with 30 ml of ethylene glycol using the Precision Chemical pump and place the vials in the proper plastic sample containers (one plastic container for each stack).
15	Fill one 20 ml vial for each stack with approximately 15 ml of ethylene glycol using the precision chemical pump. Place these vials in the plastic sample containers. These vials are used as "blank" samples.
16	Place the Tritium Stack Sample Data Form and Chain of Custody Records and the HPAL Submittal Forms in the containers with the associated vials.

Bubbler sample vial collection

Collecting bubbler sample vials

Normally, all bubbler sample vials are collected during one day. Perform the following steps to collect the bubbler sample vials:

Step	Action
1	Before collecting bubbler sample vials, see the Worker safety section of this procedure and review safety needs and requirements. <u>DO NOT perform work under conditions you consider unsafe.</u>
2	Pylox gloves and safety glasses or goggles are the minimum PPE required for bubbler sample vial collection. Individual facilities may have additional PPE requirements for facility access. Don all required PPE.
3	Visually verify bubbler operation: <ul style="list-style-type: none"> • temperature ($475^{\circ}\text{C} \pm 10^{\circ}$) • sample flow (cc/min) • totalizing • all Vials bubbling • vials installed in correct order A-F.
4	Fully raise the gate that covers the bubbler sample vials. The amber gate lamp should illuminate. This lamp indicates that the bubbler is sampling fresh air as opposed to the stack effluent.
5	Record the “Date Stop” and “Time Stop” on the Tritium Stack Sample Data Form and Chain of Custody Record (Attachment 2) for the vials being removed.
6	Unscrew and slowly remove vial “A.” Set the vial on the ledge directly under its dip tube so it can completely drain. When viewing the bubbler from the front, vial “A” is the left hand vial and “F” is the right hand vial.
7	Repeat step 6 for the remaining vials alphabetically from vial “B” through vial “F.”
8	Record sample flow rate, totalizer reading, and temperature (palladium catalyst bed temperature indicated on the bubbler front panel) on the Tritium Stack Sample Data Form and Chain of Custody Record prepared the previous week.
9	Reset the bubbler totalizer by pressing the totalizer button.
10	After allowing the dip tubes to drain into the vials for at least 1 minute, touch the inside lip of vial “A” to the tip of its dip tube. This allows adhering glycol drops to drain from the dip tube into the vial.
11	Cap the vial with the cap used for initial weighing and place the vial in the plastic sample container.

Steps continued on next page.

Bubbler sample vial collection, continued

Step	Action
12	Repeat Steps 10 and 11 for the remaining vials alphabetically from vial "B" through vial "F."
13	Replace the sample vials in <u>reverse</u> alphabetical order ("F" to "A") with the previously prepared fresh sample vials. Sample vials should only be installed finger tight. Do not install the next vial unless rapid bubbling is observed in the sample vial just installed. This will ensure that each vial is leak-free before the next vial is installed.
14	Lower the gate to the operating position. The amber "Gate" and red "Fault" lamps should be out after lowering the gate. This indicates that the bubbler is operating normally and is sampling the stack effluent.
15	Record the "Time Start" on the Tritium Stack Sample Data Form and Chain of Custody Record for the vials being installed.
16	Verify normal operating conditions: <ul style="list-style-type: none"> • Temperature: 465°C to 485°C • Flow Rate: calibrated for each bubbler cc/min • All vials are bubbling • Totalizer is counting • "Gate" and "Fault" lamps are not illuminated If problems are noted, record them on the Tritium Stack Sample Data Form and Chain of Custody Record. Contact HSR-4 RIC if problems are equipment-related.
17	Sign the Tritium Stack Sample Data Form and Chain of Custody Record.

Sample chain of custody

The bubbler sample vials must be controlled at all times. Each transfer of custody must be indicated on the Tritium Stack Sample Data Form and Chain of Custody Record until custody is transferred to HPAL on an HPAL Submittal Form. The sample vials must be under the positive control of the current custodian or be maintained in a locked container. The Tritium Stack Sample Data Form and Chain of Custody Record for each set of vials must be kept with the sample vials until delivered to HPAL.

Post-collection measurements

Overview Post-sample period full vial weights are required for completion of sample analysis. The full vials will be weighed at the HSR-4 HPAL laboratory using the certified balance at this location.

Transportation of samples with elevated radioactivity Department of Transportation requirements for transportation of radioactive samples (49 CFR 173 Subpart I) over 2 nanocuries per gram requires the use of a container that is properly labeled and resistant to coming open in a crash. All spiked tritium samples and possibly some collected samples (after a facility release) could exceed the DOT limits. Use the special cooler for transporting all spiked samples and any samples from a potential facility tritium release.

Required post-collection measurements Perform the following steps before delivering the collected samples to HPAL for analysis:

Step	Action
1	At the TA-50 HPAL laboratory, pick up two randomly selected spike samples from the locked file drawers assigned to MAQ.
2	Return all bubbler sample vials to the TA-50-35 HPAL laboratory.
3	Before weighing the full sample vials using the HPAL laboratory calibrated electronic balance, check the calibration expiration date; and verify performance by checking the balance using 100 gram, 20 gram, and 5 gram certified weights traceable to NIST. If the scale reading for any weight is not within ± 0.2 grams of the certified weight, have the scale re-calibrated before weighing the samples. Record this check on Tritium Stack Sample Data Form and Chain of Custody Record and sign and date the entry.
4	Weigh the glycol-filled bubbler sample vials (with the caps on) on the calibrated balance.
5	Record the vial and glycol weights on the Tritium Stack Sample Data Form and Chain of Custody Record under "Full Weight."
6	Complete the HPAL Submittal Form for all bubbler sample sets. Do not sign the form until the samples are actually delivered to HPAL.

Delivering samples to HPAL

Overview HPAL requires an HPAL Submittal Form for each set of vials delivered for analysis. Normally, samples should be delivered to HPAL for analysis before noon on Tuesday.

Delivering sample vials to HPAL Perform the following steps **at HPAL** when delivering the samples for analysis:

Step	Action
1	Don a lab coat.
2	Log in Tritium samples at TA-50 HPAL lab computer station. <ul style="list-style-type: none"> • TA and site of sample • Number of samples and spikes • Z-number • Barcode
3	Repeat above step for each sampled stack and spikes.
4	Sign the HPAL Submittal Form and the Tritium Stack Sample Data Form and Chain-of-Custody Record to transfer custody of the sample vials to HPAL. Keep the Tritium Stack Sample Data Form and Chain-of-Custody Record for MAQ's records.
5	Have an HPAL representative sign the HPAL Submittal Form to document HPAL acceptance of sample custody.
6	Transfer the samples and the HPAL Submittal Form to HPAL personnel for analysis of the samples.
7	Retain the yellow copy of the HPAL Submittal Form for MAQ's records.
8	At this time, the samples from the previous week may be washed (see steps 5 and 6 in the chapter <i>Pre-collection preparation</i>).

Unscheduled bubbler sample vial collection

Overview

Unusual circumstances at a facility may require an ESH-1 RCT to immediately collect the bubbler sample vials. Performing the standard collection and documentation procedure described previously may not be possible. These situations must be accommodated, but minimized. Extreme care must be taken to ensure the validity of the samples for demonstrating compliance.

Steps for unscheduled collection

Perform the following steps to collect the bubbler sample vials:

Step	Action
1	Before collecting bubbler sample vials, see the Worker safety section of this procedure and review safety needs and requirements. <u>DO NOT perform work under conditions you consider unsafe.</u>
2	Label 6 new bubbler sample vial caps with the vial identification “A” through “F.”
3	Weigh the clean, empty bubbler sample vials to be used (with caps installed) on a calibrated balance.
4	Record the sample vial empty weights for vials “A” through “F” on the Tritium Stack Sample Data Form and Chain-of-Custody Record for unscheduled sample collection (Attachment 3). An HPAL bar-code tracking sticker is not required on this form.
5	Change the sample vials by following the steps specified in the chapter <i>Bubbler sample vial collection</i> of this procedure (except use Attachment 3 in place of Attachment 2). Provide a suitable container for transporting the full sample vials. The plastic sample containers used by MAQ will not be available.
6	Record the date and time the vials were removed from the bubbler on the Tritium Stack Sample Data Form and Chain of Custody Record for unscheduled sample collection (Attachment 3).
7	Weigh the just-removed sample vials with caps installed on a calibrated balance and record the results on the Tritium Stack Sample Data Form and Chain-of-Custody Record for unscheduled sample collection.
8	After weighing, an aliquot <i>may</i> be removed from any or all of the sample vials. Before removing an aliquot, mix the contents of each vial by gently swirling the vial with a cap installed . Use a pipette to remove the aliquots. Clean the pipette between aliquots (or use a fresh tip). Record the volume of each aliquot removed in the “Remarks” section of the Tritium Stack Sample Data Form and Chain-of-Custody Record for unscheduled sample collection.

Steps continued on next page.

Unscheduled bubbler sample vial collection, continued

Step	Action
9	Record the reason for the unscheduled sample collection on the Tritium Stack Sample Data Form and Chain-of-Custody Record for unscheduled sample collection. Immediately notify MAQ of the unscheduled sample collection by calling 5-8855. During off-hours, leave a message on voice mail. Fax the completed Tritium Stack Sample Data Form and Chain-of-Custody Record for unscheduled sample collection to MAQ at 5-8858.
10	Either store the bubbler vials in a secure location (under the positive control of the sample custodian) until MAQ can pick them up, or deliver the samples to the HPAL laboratory at TA-50. This will maintain chain-of-custody and allow the samples to be analyzed for MAQ compliance reporting.

Sample custody during bubbler calibration

Overview

During bubbler calibrations performed by HSR-4 RIC personnel, the bubbler vials containing actual tritium stack emission samples must be removed from the bubblers and replaced with vials for the calibration process. During the calibration process, chain of custody must be maintained for the removed emission sample vials.

Steps to maintain custody

Perform the following steps during a bubbler calibration to maintain chain of custody of the tritium stack emission sample vials:

Step	Action
1	Before removing the bubbler sample vials, see the Worker safety section of this procedure and review safety needs and requirements. DO NOT perform work under conditions you consider unsafe.
2	Pylox gloves and safety glasses or goggles are the minimum PPE required for bubbler sample vial collection. Individual facilities may have additional PPE requirements for facility access. Don all required PPE.
3	Fully raise the gate that covers the bubbler sample vials. The amber gate lamp should illuminate. This lamp indicates that the bubbler is sampling fresh air instead of the stack effluent.
4	Record sample flow rate, totalizer reading, and temperature (palladium catalyst bed temperature indicated on the bubbler front panel) on the Sample Custody Record for Bubbler Calibration (Attachment 5).
5	Record the “Date Stop” and “Time Stop” on the Sample Custody Record for Bubbler Calibration (Attachment 5) for the emission sample vials being removed.
6	Unscrew and slowly remove vial “A.” Set the vial on the ledge directly under its dip tube so it can completely drain. When viewing the bubbler from the front, vial “A” is the left hand vial and “F” is the right hand vial.
7	Repeat step 6 for the remaining vials alphabetically from vial “B” through vial “F.”
8	After allowing the dip tubes to drain into the vials for at least 1 minute, touch the inside lip of vial “A” to the tip of its dip tube. This allows adhering glycol drops to drain from the dip tube into the vial.
9	Cap the vial and place the vial in the HSR-4 RIC Lock Box for tritium bubbler sample vials.
10	Repeat Steps 8 and 9 for the remaining vials alphabetically from vial “B” through vial “F.”

Steps continued on next page.

Sample custody during bubbler calibration, continued

Step	Action
11	Lock the Lock-Box and store in a safe location near the bubbler until the bubbler calibration is completed.
12	Record the date and time the samples were locked into the Lock Box on the Sample Custody Record for Bubbler Calibration (Attachment 5). Record name, date, and sign the form. This indicates you had custody of the samples and relinquished custody to the Lock Box.
13	After completing the bubbler calibration, retrieve the Lock Box containing the removed sample vials. Unlock the box and record the date and time the Lock Box was unlocked on the Sample Custody Record for Bubbler Calibration (Attachment 5). Record name, date, and sign the form. This indicates current custody of the samples from the Lock-Box.
14	Replace the previously removed sample vials in <u>reverse</u> alphabetical order ("F" to "A"). Sample vials should only be installed finger tight. Do not install the next vial unless rapid bubbling is observed in the sample vial just installed. This will ensure that each vial is leak-free before the next vial is installed.
15	Lower the gate to the operating position. The amber "Gate" and red "Fault" lamps should be out after lowering the gate. This indicates that the bubbler is operating normally and is sampling the stack effluent.
16	Record the "Time Start" on the Sample Custody Record for Bubbler Calibration (Attachment 5) for the vials being installed.
17	Record sample flow rate, totalizer reading, and temperature (palladium catalyst bed temperature indicated on the bubbler front panel) on the Sample Custody Record for Bubbler Calibration (Attachment 5).
18	Verify normal operating conditions: <ul style="list-style-type: none"> • Temperature: 465°C to 485°C • Flow Rate: as given on bubbler instrument, cc/min • All vials are bubbling • Totalizer is counting • "Gate" and "Fault" lamps are not illuminated If problems are noted, immediately notify MAQ.
19	Submit the completed Custody Record for Bubbler Calibration to MAQ along with the Calibration Data Packet.

Records resulting from this procedure

Records

The following records generated as a result of this procedure are to be submitted **within 3 weeks of generation** to the records coordinator:

- Completed Tritium Stack Sample Data Form and Chain of Custody Record (Attachment 2)
- Completed HPAL Submittal Form (Attachment 4)
- Completed Tritium Stack Sample Data Form and Chain of Custody Record for unscheduled sample collection (when used) (Attachment 3)
- Completed Sample Custody Record for Bubbler Calibration (Attachment 5) (when used)

HAZARD CONTROL PLAN

1. The work to be performed is described in this procedure.

“Collecting Tritium Stack Bubbler Samples”

2. Describe potential hazards associated with the work (use continuation page if needed).

A: Radiologically controlled areas: Personnel must enter radiological areas weekly, contamination possible.

B: Chemical splash: personnel handles vials with chemical “Glycol” can possibly splash in face.

C: Fall: Step ladder is used to reach one tritium sampler “bubbler,” 10’ ladder used at 21-155.

3. For each hazard, list the likelihood and severity, and the resulting initial risk level (before any work controls are applied, as determined according to LIR300-00-01, section 7.2)

A: Radiological: Improbable / Moderate = Minimal

B: Chemical Splash: Improbable / Negligible = Minimal

C: Fall: Remote / Catastrophic = Low

Overall *initial* risk: ☐ Minimal ☒ Low ☐ Medium ☐ High

4. Applicable Laboratory, facility, or activity operational requirements directly related to the work:

☐ None ☒ List:

Work Permits required? ☒ No ☐ List:

Rad worker II

Site-specific training for each facility to be entered.

HAZARD CONTROL PLAN, continued

5. Describe how the hazards listed above will be mitigated (e.g., safety equipment, administrative controls, etc.):

- A: All facilities strictly control entry into these areas with sign-in and escort procedures.
Contamination controlled by PPE requirements. Facilities have area alarms to reduce chances of exposure.
- B: Protect with PPE: goggles, gloves, etc.
- C: Personnel awareness of working environment.

6. Knowledge, skills, abilities, and training necessary to safely perform this work (check one or both):



Group-level orientation (per MAQ-032) and training to this procedure.

Other → See training prerequisites on procedure page 3. Any additional describe here:

7. Any wastes and/or residual materials? (check one) ☒ None ☐ List:

Ethylene glycol is disposed in rad waste sinks according to an approved waste profile (36 vials per week).

8. Considering the administrative and engineering controls to be used, the *residual* risk level (as determined according to LIR300-00-01, section 7.3.3) is (check one):

☐ Minimal ☒ Low ☐ Medium (requires approval by Division Director)

9. Emergency actions to take in event of control failures or abnormal operation (check one):

☐ None ☒ List:

- A: Notify ESH-1 RCT and follow instructions.
- B: Proceed to wash station and flush with water.
- C: Notify facility for assistance, call for emergency help.

Signature of preparer of this HCP: This HCP was prepared by a knowledgeable individual and reviewed in accordance with requirements in LIR 300-00-01 and LIR 300-00-02.

Preparer(s) signature(s)

Name(s) (print)

/Position

Date

Signature by group leader on procedure title page signifies authorization to perform work for personnel properly trained to this procedure. This authorization will be renewed annually and documented in MAQ records.

Controlled copies are considered authorized. Work will be performed to controlled copies only. This plan and procedure will be revised according to MAQ-022 and distributed according to MAQ-030.

MAQ, Meteorology and Air Quality

Tritium Stack Sample Data Form and Chain of Custody Record

This form is from MAQ-106

Sample Flow (cc/min): _____ Totalizer Reading: _____ Temperature (°C): _____	Stack Name (TA-Bldg-ES) _____ Tritium Stack Sample _____	Place Bar-code Tracking Sticker Here
--	---	---

Vial ID	Full Wt. (g)	Vial Wt. (g)	Glycol Wt. (g)	Date Start	Time Start	Date Stop	Time Stop	Matrix	Container Type	Analysis Requested	Remarks
A								Ethylene Glycol	60 ml Vial	Liquid Scintillation	
B				Same as Above	Same as Above	Same as Above	Same as Above	Ethylene Glycol	60 ml Vial	Liquid Scintillation	
C				Same as Above	Same as Above	Same as Above	Same as Above	Ethylene Glycol	60 ml Vial	Liquid Scintillation	
D				Same as Above	Same as Above	Same as Above	Same as Above	Ethylene Glycol	60 ml Vial	Liquid Scintillation	
E				Same as Above	Same as Above	Same as Above	Same as Above	Ethylene Glycol	60 ml Vial	Liquid Scintillation	
F				Same as Above	Same as Above	Same as Above	Same as Above	Ethylene Glycol	60 ml Vial	Liquid Scintillation	
Blank				Same as Above	Same as Above	Same as Above	Same as Above	Ethylene Glycol	Any Vial	Liquid Scintillation	

Balance within calibration expiration? Y N	Sample collector(s) (print and sign): _____
--	---

Comments

Relinquished by (print + sign)	Date/Time	Relinquished by (print + sign)	Date/Time	Relinquished by (print + sign)	Date/Time	Relinquished by (print + sign)	Date/Time	Relinquished by (print + sign)	Date/Time
Received by (print + sign)		Received by (print + sign)		Received by (print + sign)		Received by (print + sign)		Received by (print + sign)	

Sample Disposal Date	Sample Disposal Time	Disposal by (print and sign)	Disposal Location

UNSCHEDULED SAMPLE COLLECTION

MAQ, Meteorology and Air Quality

UNSCHEDULED SAMPLE COLLECTION

Tritium Stack Sample Data Form and Chain of Custody Record

This form is from MAQ-106

Sample Flow (cc/min): _____ Totalizer Reading: _____ Temperature (°C): _____	Stack Name (TA-Bldg-ES) _____ Tritium Stack Sample	
--	--	--

Vial ID	Old Vial Full Weight (g)	New Vial Empty Weight (g)	Date Collected	Time Collected	Matrix	Container Type	Analysis Requested	Remarks
A					Ethylene Glycol	60 ml Vial	Liquid Scintillation	
B			Same as Above	Same as Above	Ethylene Glycol	60 ml Vial	Liquid Scintillation	
C			Same as Above	Same as Above	Ethylene Glycol	60 ml Vial	Liquid Scintillation	
D			Same as Above	Same as Above	Ethylene Glycol	60 ml Vial	Liquid Scintillation	
E			Same as Above	Same as Above	Ethylene Glycol	60 ml Vial	Liquid Scintillation	
F			Same as Above	Same as Above	Ethylene Glycol	60 ml Vial	Liquid Scintillation	
Blank			Same as Above	Same as Above	Ethylene Glycol	Any Vial	Liquid Scintillation	

ESH-1 RCT (print and sign) _____	Immediately call 665-8855 to notify MAQ of unscheduled sample collection. After delivery and transfer of custody to HPAL, FAX completed form to 665-8858.
--	--

Reason for Unscheduled Sample Collection:

Relinquished by (print and sign)	Date/Time	Relinquished by (print and sign)	Date/Time	Relinquished by (print and sign)	Date/Time	Relinquished by (print and sign)	Date/Time
Received by (print and sign)		Received by (print and sign)		Received by (print and sign)		Received by (print and sign)	

Sample Disposal Date	Sample Disposal Time	Disposal by (print and sign)	Disposal Location

HPAL SUBMITTAL FORM

<div style="border: 1px solid black; border-radius: 10px; background-color: #f0f0f0; padding: 2px; margin-bottom: 5px; text-align: center;">SAMPLE DESCRIPTION</div> <p>Sample Date/Time: _____ No. Of Samples: _____</p> <p>TA: _____ Bldg: _____</p> <p>RCT: _____ Z Number: _____</p> <p>RCT Signature: _____ MS: _____</p> <p>Phone/Fax: _____</p> <div style="border: 1px solid black; border-radius: 10px; background-color: #f0f0f0; padding: 2px; margin-top: 5px; text-align: center;">TYPE OF SAMPLE SUBMITTED</div> <p> <input type="checkbox"/> Smear <input type="checkbox"/> LAS <input type="checkbox"/> Oils <input type="checkbox"/> Liquid <input type="checkbox"/> Soil <input type="checkbox"/> Solid <input type="checkbox"/> CAM <input type="checkbox"/> Air Sample <input type="checkbox"/> Nasal Swipe <input type="checkbox"/> Wound <input type="checkbox"/> Stack <input type="checkbox"/> Special/Type: _____ </p>	<div style="border: 1px solid black; border-radius: 10px; background-color: #f0f0f0; padding: 2px; margin-bottom: 5px; text-align: center;">SAMPLE TRACKING NUMBER</div> <div style="border: 1px solid black; border-radius: 10px; background-color: #f0f0f0; padding: 2px; margin-top: 5px; text-align: center;">SAMPLE PRIORITY STATUS</div> <div style="border: 1px solid black; border-radius: 10px; background-color: #f0f0f0; padding: 2px; margin-top: 5px; text-align: center;">REMARKS</div>
--	--

SAMPLE

Relinquished by	Date	Time	Received by	Date	Time
Printed Name					
Signature					
Z Number					
Printed Name					
Signature					
Z Number					
Printed Name					
Signature					
Z Number					
Printed Name					
Signature					
Z Number					
Printed Name					
Signature					
Z Number					

Sample Custody Record for Bubbler Calibration

Stack Identification: TA _____ Bldg _____ ES _____

Sample Vial Removal	Sample Vial Replacement
Sample Flow (cc/min): _____	Sample Flow (cc/min): _____
Totalizer Reading: _____	Totalizer Reading: _____
Temperature (° C): _____	Temperature (° C): _____
Date Stop: _____	Date Start: _____
Time Stop: _____	Time Start: _____

Vials into Lock Box	Vials out of Lock Box
Name: _____	Name: _____
Signature: _____	Signature: _____
Date Lock Box locked: _____	Date Lock Box unlocked: _____
Time Lock Box locked: _____	Time Lock Box unlocked: _____

[illegible]

Sample Custody Record for Bubbler Calibration

Stack Identification: TA _____ Bldg _____ ES _____

Sample Vial Removal	Sample Vial Replacement
Sample Flow (cc/min): _____	Sample Flow (cc/min): _____
Totalizer Reading: _____	Totalizer Reading: _____
Temperature (° C): _____	Temperature (° C): _____
Date Stop: _____	Date Start: _____
Time Stop: _____	Time Start: _____

[illegible]